Biosurfactants: Microbiology and Biotechnology

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Surfactants, due to their surface activity properties, are considered one of the most important and versatile class of chemical products, used for a variety of applications, such as household, environment, industry and agriculture (Deleu and Paquot, 2004). Biosurfactants are molecules that exhibit pronounced surface and emulsifying activities, produced by a variety of microorganisms. A wide range of chemical structures can be found among these compounds, such as glycolipids, lipopeptides, polysaccharide protein complexes, phospholipids, fatty acids and neutral lipids (Ahimou et al., 2001; Angelova and Schmauder, 1999; Desai and Banat, 1997; Lin, 1996; Rodrigues et al., 2006).

In the beginning, biosurfactants were noticed as good hydrocarbon solubilization agents, but the interest in these molecules has increased considerably in the past five decades as an alternative to chemical surfactants (carboxylates, sulphonates and sulphate acid esters) specially in food, pharmaceutical and oil industry (Banat et al., 2000; Desai and Banat, 1997). The main reasons for the spreading interest in biosurfactants are their environmental friendly nature, since they are easily biodegradable (Mohan et al., 2006) and have low toxicity (Flasz et al., 1998), in addition to their unique structures which provide new interesting features that their chemical counterparts may lack (Nitschke and Costa, 2007).

Several organic reactions (esterifications, interesterifications, transesterifications and hydrolysis) can be accomplished via chemical or biochemical catalytic synthesis. The use of biocatalysts can largely improve a process, namely reducing the operational costs as a consequence of smaller reaction times, lower energetic needs and less time consuming procedures. Therefore, it is increasing the interest on the application of biochemical catalysis for organic synthesis (Aires-Barros, 2002; Faber, 1997).

An interface is any boundary between two different phases and microbial life may be more common at interfaces as evidenced by microbial biofilms, surface films, and aggregates. Given that, all microbial life is impacted by interfacial phenomena, and biosurfactants are a common mechanism by which microorganisms deal with interfacial challenges (Van Hamme et al., 2006).

Additionally, these lipases have been used both for industrial (food industry, cosmetics and perfumes, biomedical, pesticides, detergents, among others) and research purposes. Lipase is the generic name given to a group of enzymes belonging to the class of hydrolases, and acts on ester bonds. These enzymes are not only able of catalyzing hydrolysis reactions, but also synthesis reactions in aqueous-restricted media, such as esterification reactions, interesterification, transesterification, alcoholysis and aminolysis, and by not acting on natural substrates (Jaeger and Eggert, 2002; Pandey et al.,1999).

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